Friendly Solution to Revegetation

Millions of hectares in the U.S. Northwest are covered by nonnative, invasive plants. Since the 1800s, much western rangeland has turned from diverse native plants to basically weeds.

Spotted knapweed, Russian knapweed, leafy spurge, and sulfur cinquefoil have taken over much of the land of the Northern Cheyenne Reservation near Lame Deer, Montana. The tribe has mainly used herbicides to get rid of the weeds, but they need other options that will also restore native plant populations. The tribe, along with an Agricultural Research Service (ARS) weed ecologist, is trying to reintroduce the ecologically important, culturally significant native plants that had been in the area for hundreds of years.

Roger Sheley started his research of seed source islands—small areas of a field that are planted with the desired species so that the seeds will

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Kirk Denny, a Northern Cheyenne and Montana State University extension agent, assesses rangeland health as determined by spread of *Echinacea* plants from a seed source island. Note the thicker short, green leaves of the *Echinacea,* also known as "purple coneflower," throughout the grasses.

spread to the rest of the field—in 1998 as a scientist at Montana State University (MSU). Sheley has continued this research at ARS's Range and Meadow Forage Management Research Unit in Burns, Oregon. He is working with Kirk Denny, a member of the tribe as well as an MSU extension agent.

The area Sheley is studying was used for strip mining in the 1980s. It is located about 20 miles from the reservation, but the research Sheley and Denny conduct at the site will be applicable to the reservation and to millions of acres of rangeland across the western United States. Previous efforts to remove the invasive weeds met with minimal success because desired forbs were also removed during the process. The researchers are hopeful that use of seed source islands may change this outcome.

"Seed source islands are a way to get important plants established across the landscape, if one is patient," according to Sheley.

To make these islands, Sheley plants a small plot of the desired species in the middle of a weedy area. He tested several shapes but did not note much of a difference. The islands are fenced off for a few years to give them time to grow. In the mean time, livestock eat the weeds around the island. In some cases, other methods of weed management such as herbicides, biocontrol, and mechanical control are used to weaken the competitive ability of the weeds.

After the fence is removed, the desirable plants spread outside of the island. They can take over in places where the animals have eaten the weeds and are sometimes transported unintentionally by the animals themselves. "We're able to capitalize on natural processes," Sheley points out.

Denny noted plants growing up to 100 feet away from the islands. After 4 years of research, the desirable plants are making a comeback—though some have higher success rates than others in becoming established.

"We were glad to learn that these plants could be reintroduced," Denny says. Seeds for many of the plants they were trying to grow are very expensive—up to $100 a pound. Over several hundred acres, costs could run to tens of thousands of dollars in seeds alone. Planting the seeds only on small islands keeps these costs down. Over time, the seeds will move outside of the island and across the landscape.

Doing it naturally is better for the environment—and less expensive—than several high-energy-consuming methods that often fail, such as mechanical tillage and drill seeding. The natural method can take a lot longer to establish the plants, but it ensures that a seed source is constantly available to respond when environmental conditions are just right.

> "Seed source islands are a way to get important plants established across the landscape, if one is patient."—Roger Sheley

Possibly the most important reason to reintroduce plants is that many are of cultural and medicinal importance to the tribe and of ecological significance to achieving a sustainable, invasion-resistant plant community. Developing cost-effective methods for restoring weed-infested areas is important for a wide variety of values.

Sheley and Denny worked with the tribal cultural commission to get permission to study certain plant species and to make sure the research would not harm any important plants. As Sheley points out, "The loss of indigenous species is culturally and ecologically unacceptable to most tribes and resource groups."

Sheley says it's also possible to restore the nitrogen cycle by bringing back the natural plants. In an associated study, he found that native forbs were essential to the nitrogen cycling of many ecosystems. He also found that these forbs occupied the same niche as most broadleaf weeds. Including forbs is critical to successfully restoring weed-infested systems.

In the future, Sheley plans on restoring plants on larger ranges. This will lead to the research being used in actual management practices. He'll also study the introduction and reintroduction of other plants on other types of soil. He believes that his research is applicable to most western rangelands in need of restoration. It is also appropriate to use seed source islands where conventional revegetation is difficult.

Denny was originally interested in alternatives to herbicides to get rid of the invasive plants on the reservation. He was concerned that herbicides might kill nontarget species. He envisions moving his investigation from the research plots to the reservation and using the techniques to restore and rehabilitate areas previously treated with a broadleaf herbicide.

Another scientist at the Range and Meadow Forage Management Research Unit is also working with an American Indian tribe to conduct ecological research. Rangeland scientist Chad Boyd is working with the Burns Paiute Tribe to study flood irrigation. His research is helping the tribe decide whether to reintroduce flood irrigation and how that would affect grasses and wildlife. For more information about this research, see the November 2003 issue of *Agricultural Research* magazine.—By **David Elstein,** ARS.

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